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Chemical capacity use finally moves up Page 7

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Cover: Cos-Mar's ethylbenzene-styrene complex at Carville, La. Photo courtesy of Badger, builder of the unit. Photo copyrighted by Ted Polumbaum

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CHEMICAL & ENGINEERING
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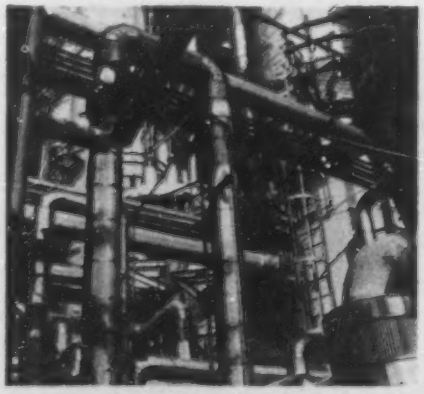


News Focus

Capacity use rates for the U.S. chemical industry are inching upward; polymers lead the way. **Page 7**

Chemical Capacity Use Finally Rebounds

U.S. chemical plants are running 64% of capacity, polymer plants, 71%, as a seemingly endless recession has at last given way to a fairly vigorous upturn

William F. Fallwell, C&EN Washington
Bruce F. Greek, C&EN Houston

Pennwalt chairman Edwin E. Tuttle said it for everybody in his company's first-quarter report: "Chemical operating rates are inching upward, and, although the situation is still far from satisfactory, we are delighted with the improvement that finally seems to be under way."

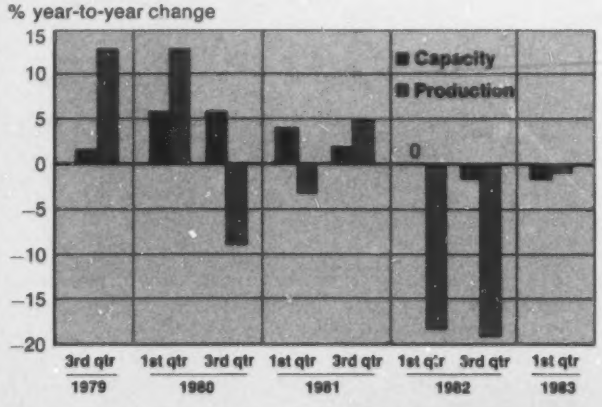
That's precisely the conclusion emerging from C&EN's semiannual capacity use survey of major U.S. basic chemicals and polymers. By themselves, the resulting data are still pretty depressing—it isn't the best of times when plants are running at less than two thirds of rated capacity. However, an underlying tide of market gains, especially in polymers, is beginning to have an effect. Plant use rates are now decidedly higher than a year ago.

C&EN's data undoubtedly understate the actual improvement that has taken place. At the moment, plant use rates are an upward-moving target. Because of the natural lag in use estimates by the many industry analysts assisting in the survey, resulting averages are for the first quarter of the year. Current second-quarter operations, from signals such as the April gain in the workweek, are up at least a few percentage points from the first quarter.

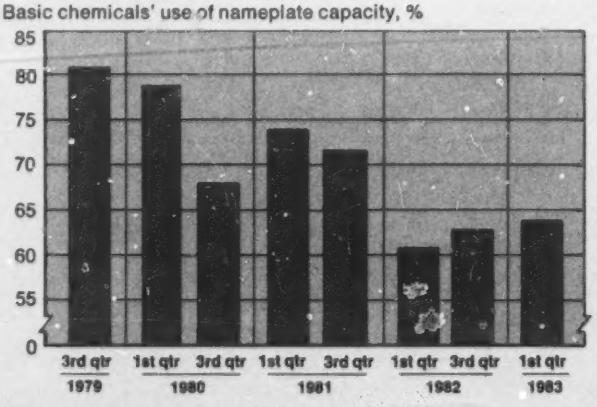
With this caveat, here are the main points emerging from the present survey of 32 basic chemicals and 11 polymers:

- Nameplate capacity use in the basic chemical group has crawled up another notch since last summer, reaching 64% in the first quarter. A year ago, at its lowest point, the figure was 61%. For perspective, the recent high point was 81% in mid-1979.
- Polymer plant use is moving sprightlier. The first-quarter reading of 71% is up from 69% last summer and

Chemical production fell much more than capacity in 1982 ...



... leading to current low level of capacity use



Sources: Industry and government data, C&EN estimates

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Effective plant use in basic chemicals recovers to 70%

Billions of lb per year unless otherwise noted[a]	First-quarter 1983			Third-quarter 1982			First-quarter 1982		
	Capacity (nameplate)	Capacity use Nameplate	Effective	Capacity (nameplate)	Capacity use Nameplate	Effective	Capacity (nameplate)	Capacity use Nameplate	Effective
Petrochemicals—olefins and aromatics[b]									
Ethylene	39.0	67%	74%	39.0	61%	68%	39.7	56%	62%
Propylene (chemical and polymer)	23.0	49	54	23.0	56	62	23.0	44	48
Butadiene[c]	4.5	37	41	4.4	40	44	4.6	42	47
Benzene (bg)	2.3	43	48	2.4	48	53	2.4	44	49
p-Xylene	4.9	68	72	4.9	60	63	5.5	54	57
Petrochemicals—C_1 derivatives									
Ammonia (mt)[d]	18.7	71	75	19.8	82	87	19.8	84	88
Urea (mt)[d]	7.8	73	81	7.8	72	80	7.8	65	73
Methanol (bg)	1.7	56	62	1.6	76	84	1.5	72	80
Formaldehyde (37% solution)	9.2	55	58	8.9	47	49	8.9	51	54
Chlor-alkalies									
Chlorine (mt)	14.4	67	71	14.6	64	67	14.8	62	65
Caustic soda (mt)	15.4	66	69	15.6	61	64	15.7	59	62
Soda ash (mt)	10.7	74	78	10.9	73	77	10.4	76	80
Acids[d]									
Sulfuric (mt)	57.5	59	62	59.6	49	52	59.4	54	57
Phosphoric (P_2O_5, mt)[e]	12.5	71	75	12.6	64	67	12.4	62	65
Industrial gases									
Oxygen, Nitrogen (total, liquid, ttd)	37.0	64	78	36.6	65	82	37.6	64	80
Carbon dioxide (ttd)	18.9	61	68	18.4	67	75	17.7	63	70
Mineral-based inorganics									
Sulfur (total, mlt)	15.5	48	—	15.8	53	—	15.7	61	—
Potash (mt)	2.2	86	—	2.7	74	—	2.7	84	—
Phosphorus (mt)	0.55	82	86	0.55	68	72	0.55	66	69
Plastics intermediates									
Styrene[f]	8.2	64	75	8.7	69	81	8.7	79	93
Vinyl chloride	10.1	65	72	10.0	68	76	9.6	50	56
Toluene diisocyanate	0.75	90	99	0.73	73	81	0.73	74	82
Fiber intermediates									
DMT-PTA[g]	7.3	64	75	7.3	56	66	7.3	58	68
Ethylene oxide	7.3	76	84	6.8	67	74	6.8	68	76
Cyclohexane	3.4	31	29	3.1	37	39	3.1	33	35
Adhesives, coatings intermediates									
Phenol[f]	3.6	64	71	3.6	61	68	4.0	56	62
Vinyl acetate	2.4	90	95	2.3	91	96	2.4	72	76
Pigments									
Carbon black	3.3	63	70	3.4	62	69	3.4	75	83
Titanium dioxide (mt)	1.0	60	71	1.0	61	72	1.0	53	62
Solvents									
Acetone[f]	3.3	57	63	3.3	53	59	3.6	59	66
Ethanol (mg)	240	72	76	240	75	79	270	50	53
Methylene chloride	0.83	59	66	0.83	63	70	0.83	54	60
AVERAGE		**64%**	**70%**		**63%**	**69%**		**61%**	**66%**

a bg = billions of gal, mt = millions of tons, tt = thousands of tons, ttd = thousands of tons per day, mlt = millions of long tons, mg = millions of gal. b About 25% of ethylene and lesser amounts of other capacity currently is shut down because of weak markets. c Total extraction capacity, which runs about 25% more than basic production capacity. d Some capacity, possibly 15%, shut down. e Includes both wet-process and furnace-process capacity. f Up to 10% of capacity currently shut down. g Dimethyl terephthalate and purified terephthalic acid, not including acid converted to DMT. **Sources:** Industry and government sources, C&EN estimates

66% a year ago. Polymers' last peak was 85% in early 1980.

• Plant use rates figured on effective top capacity (subtracting 5 to 15% of nameplate capacity because of inevitable glitches in operations) have reached 70% in basic chemicals and 77% in polymers. That's up from 66% and 71%, respectively, a year ago.

• Underneath these capacity use numbers, production is still down 1% from a year ago for the chemical group but is up 11% in polymers. At the same time, plant capacity has sunk 2% in chemicals and gained 3% in polymers. This drop in chemical capacity is very conservatively stated, since it doesn't include plants mothballed until economic conditions improve. Hence, the decline

Plant use has continued to pull up in plastics and synthetic fibers

Billions of lb per year	First-quarter 1983 Capacity (nameplate)	First-quarter 1983 Capacity use Nameplate	First-quarter 1983 Capacity use Effective	Third-quarter 1982 Capacity (nameplate)	Third-quarter 1982 Capacity use Nameplate	Third-quarter 1982 Capacity use Effective	First-quarter 1982 Capacity (nameplate)	First-quarter 1982 Capacity use Nameplate	First-quarter 1982 Capacity use Effective
PLASTICS									
Polyethylene, low density	10.1	74%	79%	9.3	76%	81%	9.3	71%	76%
Polyvinyl chloride[a]	8.9	55	64	8.4	59	69	8.4	59	69
Polyethylene, high density	6.3	85	89	6.1	82	86	6.1	66	69
Polypropylene	5.1	83	92	5.1	81	88	5.1	67	74
Polystyrene[a]	5.3	55	65	5.3	60	71	5.3	53	62
AVERAGE		**70%**	**78%**		**68%**	**75%**		**64%**	**71%**
SYNTHETIC FIBERS									
Filament yarn									
Polyester	1.6	83	88	1.6	76	81	1.8	74	79
Nylon	1.9	64	68	2.0	64	68	2.0	60	64
Olefin	1.0	48	51	0.99	60	64	0.99	64	68
Staple									
Polyester	2.7	75	80	2.8	62	66	2.8	77	82
Nylon	0.98	81	86	0.99	76	81	1.0	56	60
Acrylic	0.83	77	82	0.84	82	87	0.84	71	76
AVERAGE		**71%**	**76%**		**70%**	**75%**		**67%**	**72%**
OVERALL AVERAGE		**71%**	**77%**		**69%**	**75%**		**66%**	**71%**

a Between 5 and 10% of this capacity is shut down. **Sources:** Industry sources, Society of the Plastics Industry, Textile Economics Bureau, C&EN estimates

only hints at the drastic pruning companies have undertaken in reaction to the miserable economy of the past three years.

Such "rationalizing" of operations has left companies fairly optimistic as recovery gets under way. Tuttle at Pennwalt isn't the only one noting some progress. In Dow Chemical's first-quarter report, president Paul F. Oreffice says: "We are encouraged by the steadily increasing daily sales rate of our principal products each month."

Du Pont puts some specific numbers behind a similar view. Chairman Edward G. Jefferson says the company's chemical arm had an overall pickup in sales compared to capacity from 62% in January to 72% in March. "We are finally emerging from the worst recession since World War II. For Du Pont, the recession touched bottom in December and January. Our chemicals, plastics, fibers, and specialty products businesses have shown steady improvement in demand since early February."

Some of the specific output estimates in C&EN's present survey bear out Jefferson's observation. And as might be expected, recovery has not been uniform in the industry. Some products have hit the expansion trail much earlier than others, leaving a highly mixed situation.

Take, for example, two product groups—thermoplastics and basic petrochemicals—at opposite ends of the chemical production chain. In a typical recovery pattern, the resins are moving up much earlier than are petrochemicals, since plastics are closer to final consumer demand creating the economic recovery. For the five leading thermoplastics in C&EN's survey—high-density and low-density polyethylene, polyvinyl chloride, polypropylene, and polystyrene—output is up 6% from third-quarter 1982 and a rousing 14% from first-quarter 1982. Producers seem to sense the upswing and have kept these polymers the only major area with continuing plant expansion. Capacity for the five resins is up 4% from a year ago. As a result, capacity use has pushed up to 70% from 64% over the past year.

By contrast, the sluggish petrochemicals show only a 2% production gain from a year ago and a capacity drop of 2%. That leaves capacity use for this group of five chemicals—ethylene, propylene, butadiene, benzene, and *p*-xylene—dragging along at 56%, barely up from 54% in early 1982. Telling evidence of this slow motion came in oil companies' first-quarter reports on their chemical operations. For a group of seven companies surveyed by C&EN, petrochemical profits virtually disappeared (C&EN, May 16, page 23).

The kingpin among these petrochemicals is ethylene, which is the building block for so many downstream chemicals and plastics. Ethylene is close to the industry average in plant use, and its problems are a good illustration of the lagging condition of most basic chemicals in the economic recovery. The state of industry data on ethylene also tells a lot about the difficulty in pinning down how hard plants actually are operating.

Use of ethylene's nameplate capacity in the first quarter was about 67%. That's based on a highly optimistic estimate of 39 billion lb per year for capacity. However, up to 20% of this capacity is shut down because of poor markets, and some of it may never start up again. Hence, plants currently operating are running close to 80% of nameplate capacity. That's still not good enough for much profit to producers, who are having a hard time floating even a half-cent-per-lb price increase. There's simply too much slack in capacity and too little movement in markets.

If that isn't bad enough, other petrochemicals make ethylene look rich. In one of the worst cases, butadiene actually has slumped a bit in production from

C&EN's capacity use indicator: the ground rules

Capacity use at chemical plants is difficult to measure and requires certain assumptions. These bring some order to the maze of variables affecting this critical indicator of the industry's health.

With the help of industry and government sources, C&EN measures capacity use as a percentage of both nameplate and effective maximums. Nameplate capacity is the official design capacity of plants. Effective capacity is the practical maximum after reductions for unplanned maintenance, corrosion problems, changes in product mix, and other influences. Although engineering companies and industry statistics groups try to make nameplate capacity data as real as possible, practical problems almost always reduce effective maximums to 85 to 95% of the official totals. For short periods, plants can run more than 100% of effective top capacity, but such a rate won't last more than a few months.

Capacity use is given over as much of a calendar quarter as production data permit, with no seasonal adjustment. The figures are for plants actually operable. At present, some products such as ethylene, phenol/acetone, polystyrene, ammonia, and urea have plants temporarily shut down because of weak markets. These plants still are included in capacity totals. The totals exclude new plants just starting up and old plants out of operation for long periods because of accidents. As much as possible, capacity figures stay current with expansions.

Capacity data don't take into account other temporary fluctuations for fuel and electric power interruptions, equipment failure, and feedstock scarcity or substitution. The feedstock variables, for example, have been important in the past few years in ethylene production, altering maximum output for several coproducts such as propylene, butadiene, and benzene.

Products in C&EN's capacity use survey are the same as those in the Key Chemicals and Key Polymers series. These are the core products of the industry, the building blocks leading to downstream production of thousands of more specialized products.

a year ago, so rated capacity of 4.5 billion lb per year is running at a lowly 37%. Needless to say, many plants for making this chemical also are currently shut down. Ditto for the leading aromatic, benzene, which has a capacity use estimate of 43% for the first quarter. No wonder benzene has had almost continuous downward price pressure.

Among the C_1-based petrochemicals, recovery is also distant for most. A special problem in farm markets probably will delay any pickup another year for certain products such as ammonia. Ammonia production has fallen sharply over the past year. Plant use, even with less official capacity, has dropped to 71% from 84% in early 1982. Urea plant use isn't much better at 73%. And methanol, despite the upswing in its important housing market, sputters along at 56% plant use. The major plant investment in methanol in the past few years has not paid off, and the product's pricing is in shambles. Discounts have reached one third from list prices.

One of the few expansions this year is PPG and Du Pont's joint ethylene glycol plant at Beaumont, Tex.

Among intermediates a step or two downstream from these petrochemicals, there has been some upward motion in capacity use. An example is vinyl chloride, which has climbed to 65% from 50% in early 1982 on the new strength in the housing market for polyvinyl chloride. Another intermediate showing some life is ethylene oxide, moving up to 76% from 68% as its important market in polyester fiber awakens. That's also the case for the other major polyester precursor, dimethyl terephthalate/terephthalic acid, whose capacity use has picked up to 64% from 58%.

Overall figures for fibers don't show much motion to date, but some of the individual fibers have improved markedly. For the group of six fiber types in C&EN's survey—filament and staple polyester, filament and staple nylon, olefin filament, and acrylic staple—capacity use has moved up to 71% in first-quarter 1983 from 67% in first-quarter 1982. However, in the best case, polyester filament plants ran at 83% of capacity this year, up from 74% in early 1982. Polyester producers have become quietly optimistic, and some sources in this area say tight market conditions could be less than a year away. Similarly, nylon staple has improved greatly over the past 12 months, with capacity use up to 81% this year. Here, the housing upsurge has boosted nylon's important carpet market. □